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1 drivers through an in-vehicle system, provide location and tracking information
2 for marine navigation, and allow shipping companies to locate and track individual
3 shipments. However, the GPS system relies on an unobstructed view of several
4 satellites, making its use for tracking users who are indoors ineffective.

5 To overcome this obstacle, alternate technologies have been developed to
6 locate and track users or objects in an indoor environment. One such system uses
7 tags placed on the items that are to be tracked. In an electronic sense, the tags can
8 be either active or passive, and they communicate with base stations. The base
9 stations are physically linked together through a wired or wireless network. Each
10 tag transmits a unique code to identify itself. The location of the tag can thereby
11 be determined to be in the vicinity of the base station with which the tag last
12 communicated.

13 Such tag-based tracking and location systems require a significant
14 installation of specialized base stations. A tag-based system can only determine
15 the location of the tags as being "near" a particular base station. As a result, a
16 large number of base stations must be installed to achieve a sufficiently high
17 resolution. Furthermore, obtrusive tags have to be placed on every item that is to
18 be tracked or located, and in the case of infrared tags, the system operates only
19 when there is a line of sight between the tag and a base station. For these reasons,
20 tag-based systems have shown very limited success.

21 Another technology has been developed which uses radio frequency
22 transmissions from base stations and mobile units to track the location of mobile
23 units. This technology is described in U.S. Patent Application Number
24 09/513155, entitled "Using a Derived Table of Signal Strength Data to
25 Locate and Track a User In a Wireless Network, and in U.S. Patent Application

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Number 09/513 355, entitled "Locating and Tracking a User in a
Wireless Network Through Environmentally Profiled Data."

In this system, a Wireless Local Area Network (WLAN) is utilized for
locating and tracking users. A WLAN consists of base stations connected to a
wired network, and mobile devices that are "connected" to the WLAN through
radio frequency signals with the base stations. The signal sensing ability of both
the base station and the mobile device are used to determine the location of the
mobile device, and thus the location of the user of the mobile device. Specifically,
the strength of the received signal from several base stations is measured by the
mobile device. The mobile device then compares the signal strength from each of
the base stations to a pre-computed table containing the base stations' signal
strength at various known locations of the mobile device. From this comparison,
the mobile device determines its location. Alternatively, the strength of the signal
received from the mobile device can be measured at a number of base stations.
This signal strength is then compared by a central computer to a pre-computed
table containing the mobile computer's signal strength at the base stations for
various known locations. From this table, the central computer determines the
location of the mobile computer.

Such a system contains system resources that have a relatively fixed
location. Examples of fixed network resources include, but are not limited to,
access points, printers, copiers, scanners, office locations, etc. When a mobile user
desires to find one such fixed resource, the user submits a query to the system for
the location of such a fixed resource. The system determines the location of the
user and then searches a database on a system server that contains the location and